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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/092,310	03/07/2002	Akihiko Otoguro	020201	8414

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EXAMINER

WALKE, AMANDA C

ART UNIT

PAPER NUMBER

1752

DATE MAILED: 08/25/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

10/092,310

Applicant(s)

OTOGURO ET AL.

Examiner

Amanda C Walke

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 07 June 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-11 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-5, 10 and 11 is/are rejected.
- 7) ☒ Claim(s) 6-9 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## DETAILED ACTION

### *Claim Rejections - 35 USC § 103*

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-5, 10, and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ina in view of Zeigler (4,820,788).

Ina discloses a photoresist film patterning film and a method of patterning to form a semiconductor. The patterning film includes a substrate, an etchable film (2), a lower resist layer (3), a middle layer that is a light shielding film of an organic substance having a transmittance such that the lower resist layer is not exposed to light (4), and the upper resist layer (5). The resist layers are preferably sensitive to KrF or ArF lasers and may be positive or negative-working (column 3, line 21 to column 4, line 22). The film to be etched (2) is a polysilicon layer or SiN. In the examples, layer (2) is SiN, layer (3) is a polyvinyl phenol resin, polyvinyl alcohol was used as the organic material of layer (4), and finally, an acetal resin having an alicyclic group was used as the resist resin of layer (5). Preferred alicyclic resins of the reference include a terpolymer of methacrylic acid, tert-butyl methacrylate, and adamantyl methacrylate, and a terpolymer of methacrylic acid, tert-butyl methacrylate, methyl methacrylate, and adamantyl methacrylate (column 7, line 41 to column 8, line 27).

The method of the reference includes coating layer 2 and drying, coating layer 3, applying layer 4, and applying layer 5. Then layer 5 was exposed to an ArF excimer laser,

followed by a heat treatment and development. An etching step was then performed using oxygen plasma so that the middle layer (4) to transfer the pattern of the upper resist layer into the middle layer. Next, a KrF excimer laser was applied to the structure to expose the portions of the lower resist layer followed by a heat treatment and development. Finally, the SiN layer (2) was etched by means of an RIE etching method to transfer the pattern of the upper resist layer, middle layer, and lower resist layer to the SiN underlayer (see examples). The reference teaches that the middle layer may be any light shielding film formed of an organic substance that has a transmittance such that the lower layer is not exposed to light. While the reference employs polyvinyl alcohol in the layer in its examples, the reference is not limited to this.

Zeigler discloses organo poly(silylsilane) polymers having high photosensitivity and excellent resistance to oxygen reactive ion etching processes. These polymers are useful as barrier/etch-resistant layers in multiplayer photolithography (abstract and column 2, lines 50-67). The preferred organo group is the trimethylsilyl, which is discussed in the instant specification. The material would meet the requirements of the middle layer of Ina.

Given the teachings of the reference, it would have been obvious to one of ordinary skill in the art to prepare the material of Ina choosing to employ the organo poly(silylsilane) of Zeigler to result in increased etch resistance with reasonable expectation of achieving a material having a better pattern shape.

#### *Allowable Subject Matter*

3. Claims 6-9 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The prior art of record fails to teach or suggest to one of ordinary skill in the art to prepare a multi-layered resist structure as described by the instant claims 1 and 3 wherein the organic intermediate layer is etched selectively with respect to the lower resist layer, organic intermediate layer is etched simultaneously with etching of the patterning objective layer, the upper resist layer is etched and removed simultaneously when the lower resist layer is etched, or wherein the lower resist layer is formed thicker than the thickness of the patterning objective layer.

***Response to Arguments***

4. Applicant's arguments filed 6/7/2004 have been fully considered but they are not persuasive.

In light of the claim amendments, the 102 over Ina has been dropped, and those claims have now been included in the 103 rejection over Ina in view of Zeigler.

Applicant has argued that the Ina et al reference in combination with the Zeigler reference fails to teach or suggest the instant invention. Ina teaches a patterning film that includes a substrate, an etchable film (2), a lower resist layer (3), a middle layer that is a light shielding film of an organic substance having a transmittance such that the lower resist layer is not exposed to light (4), and the upper resist layer (5) (an alicyclic resin). The reference teaches that the middle layer may be any light shielding film formed of an organic substance that has a transmittance such that the lower layer is not exposed to light. Zeigler discloses organo poly(silylsilane) polymers having high photosensitivity and excellent resistance to oxygen reactive ion etching processes. These polymers are useful as barrier/etch-resistant layers in multiplayer photolithography. Given these teachings, it is the position of the examiner that it

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would have been obvious to one of ordinary skill in the art to prepare the material of Ina choosing to employ the organo poly(silylsilane) of Zeigler to result in increase etch resistance with reasonable expectation of achieving a material having a better pattern shape, and result in a structure and method meeting the instant claim limitations.

In light of the amendments, the 112 rejections have been dropped.

***Conclusion***

5. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

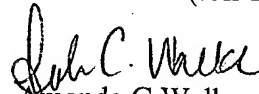
A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Amanda C Walke whose telephone number is 571-272-1337. The examiner can normally be reached on M-R 5:30-4.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Cynthia Kelly can be reached on 571-272-1526. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

  
Amanda C Walke  
Examiner  
Art Unit 1752

ACW  
August 23, 2004